DISCUSSION OF THE CLAIMS

Claims 1-10 and 24-41 are active in the present application. Claims 11-23 are canceled claims. Claim 34 is presently withdrawn from prosecution. Claims 35-41 are new claims. Support for the new claims is found in the original claims and the examples of the present specification. Claim 41 is a new independent claim. Support for new independent Claim 41 is found in the previously presented claims and throughout the specification,

No new matter is added.

REMARKS

The Office combines Zhang (US 6,432,586); Hying (US 6,620,320); and Bauer (US 6,632,561) in support of the rejection of the present claims as obvious. Applicants traverse the rejection on the grounds that (i) one of ordinary skill in the art would have no expectation that the battery of Zhang modified in the manner of Hying and/or Bauer provide a useful or operable lithium battery separator having a shutdown function, and (ii) the cited art is contradictory and/or teaches away from the presently claimed invention.

Zhang teaches a separator that is substantially different from the separator of the present claims. Zhang provides a useful description in Figure 2 of the Zhang patent. Figure 2 is reproduced below for convenience.

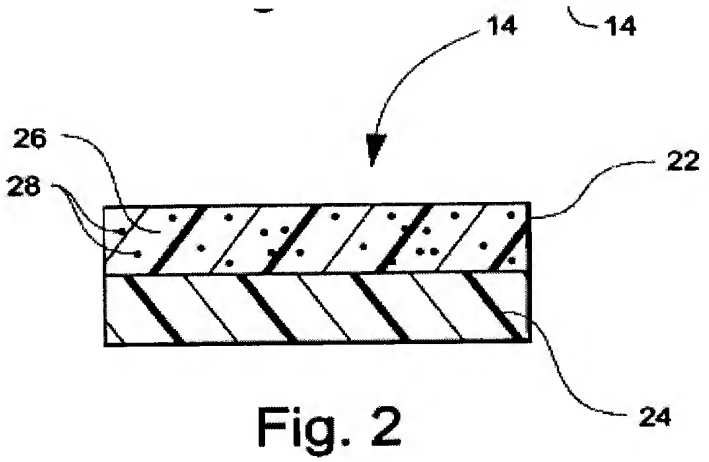

Fig. 2

The Zhang separator shown in Figure 2 has two layers. The layer identified as 24 is a porous polymer layer and the layer identified as 22 is a ceramic composite layer. The ceramic composite layer of the Zhang separator serves an important function.

> The ceramic composite layer is adapted, at least, to block dendrite growth and to prevent electronic shorting.

See column 1, lines 49-51 of Zhang.

Dendrite growth is described at column 1, lines 27-35. The Zhang ceramic composite layer functions to prevent the penetration of a dendrite into the separator. The ceramic

composite layer therefore prevents the ingress of material into the separator. This is, of course, directly contradictory to the function and advantage provided by the presently claimed lithium battery separator. The separator of the present includes a shutdown function in which a material flows into the separator to thereby block ion conduction through the separator (e.g., the pores of the ceramic layer absorb a material and thereby become clogged). New independent Claim 41 explicitly recites this functionality. For example, the ceramic material may absorb molten polymer obtained from a polymer layer that is adjacent to the ceramic layer.

Applicants submit that those of ordinary skill in the art would have no basis for believing that the separator of Zhang could be modified in a manner to provide the presently claimed separator in view of the directly contradictory functionality of the respective ceramic-containing layers, e.g., ingress prevention in contrast to ingress functionality.

Applicants thus submit that the cited art fails to suggest the presently claimed invention. Applicants request withdrawal of the rejection.

Further, the description of the Zhang ceramic composite layer underscores the analysis above. Zhang is unequivocal with respect to the characteristics of the Zhang ceramic composite layer:

> Ceramic composite layer 22 is **nonporous** (it being understood that some pores are likely to be formed once in contact with an electrolyte, but ion conductivity of layer 22 is primarily dependent upon choice of the matrix material 26 and particles 28). The matrix material 26 of layer 22 differs from the foregoing polymer matrix (i.e., that discussed above in regard to the medium of the electrolyte) in, at least, function.

See column 3, lines 11-18 of Zhang.

The Zhang patent is explicit with respect to the characterization of the ceramic composite layer as **nonporous**. A nonporous separator is further contradictory to the presently claimed invention which includes a porous carrier. This description of the Zhang

device shows that the Zhang ceramic composite layer cannot provide the functionality necessary to form a lithium battery separator having a shutdown function such as that presently claimed (e.g., because the Zhang separator would not permit the ingress of molten particles).

Applicants draw the Office's attention to new dependent Claim 35. The new dependent claim recites a coating layer that consists of a ceramic. Applicants submit that new dependent Claim 35 must be further patentable over Zhang for the reason that the Zhang ceramic composite layer must contain a matrix material in which inorganic particles are dispersed (see column 3, lines 8-9 of Zhang). The matrix material is one of the ionically nonconductive polymeric materials disclosed at column 3, lines 31-45. Applicants submit that new dependent Claim 35 therefore is further patentable over Zhang for the reason that a coating layer that consists of a ceramic excludes the ceramic composite layer of the Zhang separator.

Applicants further draw the Office's attention to new independent Claim 41 which recites a separator having a porosity of from 30-80%.

Applicants thus submit that the rejections in view of Zhang are not supportable and should be withdrawn.

Irrespective of Applicants' arguments above regarding the applicability of Zhang as relevant prior art to the presently claimed invention, Applicants further traverse the rejection of the claims for the reason that the Office improperly combines Zhang with Hying.

The Office acknowledges that Zhang does not teach a porous coating layer. The Office appears to rely on Hying as evidence that it would be obvious to include a porous coating layer in the Zhang separator. As already mentioned above, such a combination is contradictory to the function and effect of the Zhang separator. Applicants submit that the

Office's assertion that it would be obvious to modify Zhang to include a porous coating layer is directly contradictory to the explicit teachings of the Zhang patent.

Applicants thus submit that the Office's combination of Zhang with Hying is improper and the rejection should be withdrawn.

The Office further acknowledges that Zhang does not disclose a layer comprising meltable shutdown particles. The Office relies on Bauer to cure this deficiency. The Office asserts that Bauer discloses a lithium battery separator having a shutdown layer of particles which melt and thereby close the pores of an inorganic layer (see the last full paragraph of page 4 of the March 5 Office Action). Applicants submit that the Office's characterization of the Bauer separator is not correct.

Bauer discloses a composite that has first and second layers. The first layer of the Bauer composite is a composition comprising a solid (I) and a polymeric binder (II). The polymeric binder is one that contains reactive groups that crosslink when subjected to heat and/or UV radiation. With respect to forming a layer on a substrate, the Bauer compositions must first be cured before a separator is formed. For example:

> The compositions used according to the invention may be dispersed or dissolved in an inorganic or organic, preferably an organic liquid diluent, . . . , and then be applied to a substrate in a manner known . . . . Further processing may proceed as usual, e.g. by removing the diluent and curing the mixture.

See column 25, lines 34-43 of Bauer.

Applicants submit that it is readily evident to those of ordinary skill in the art that curing a mixture that contains a crosslinkable curing agent forms a crosslinked matrix. In the case of Bauer, this crosslinked matrix would serve to immobilize and/or capture any particles present in a layer which the Office asserts the particle-containing layer. Applicants further submit that such a cross-linked, cured layer has melting characteristics that are substantially different from melting characteristics of any polymer from which particles present in the

cured polymeric binder are made. It is therefore evident that the first layer of the Bauer separator is not one that contains particles of meltable shutdown particles, e.g., such as particles of a polymeric material.

Applicants submit that the Office failed to set forth a *prima facie* case of obviousness at least because any layer in the Bauer separator does not contain meltable shutdown particles but instead discloses the particles present in a cured matrix which is nowhere disclosed or described as being capable of undergoing melting to shut down any battery in Bauer.

For the reasons discussed above in detail, Applicants submit that the rejections are not supportable and should be withdrawn.

Respectfully submitted,

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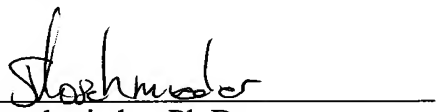

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